

Sample EMI Course Descriptions

Course #1 – Teaching the Fundamentals of Algebra I

Understanding the fundamental concepts and techniques in Algebra I is crucial to the future success of any high school mathematics student. This course will use interesting and meaningful problems that help students understand ideas in beginning algebra such as the real number line, order of operations, solving simple equations, and using linear functions and inequalities to model real world problems. How to help students learn to appropriately use graphing calculator technology will also be featured in this course.

Course #2 – Using a Hands-On Activities-Based Approach in Algebra I

This course will emphasize how to use various hands-on activities to motivate algebra students and to enhance their understanding of important concepts. Many of these hands-on activities will be exploratory in nature, will involve data collection, and will use the TI-83 graphing calculator to analyze the data. Topics explored will include slope as a rate of change, linear, quadratic, and exponential functions, systems of equations, and other topics in standard high school algebra courses.

Course #3 – Problem Solving in Algebra II

This course will feature fun, interesting, and sometimes challenging problems that can be used effectively in an Algebra II course. This will be aimed at a more advanced level than Course #1, with the problems being more difficult, the solutions more sophisticated, and the content areas more advanced. In addition to some problems from traditional Algebra I topics, content areas may include quadratics, probability, right triangle trigonometry, optimization, exponential functions, and more. Learning to use the TI-83 calculator effectively will be an important component of this course.

or Topics in Algebra II

This course will focus on various topics from Algebra II that are most interesting and important to the participants. These topics may include conics, probability, matrices, exponential functions, or whatever topics proves most desired by the class. Each participant enrolling in this course needs to list three topics below that they would like to see covered during the week.

1. _____

2. _____

3. _____

Course #4 – Using Geometer's Sketchpad to Integrate Algebra and Geometry

Geometer's Sketchpad is a marvelous tool in the geometry classroom, but the versatility, ease of use, and power of this program are also perfect for helping students understand certain algebra concepts. This course is a hands-on opportunity to learn how to use this technology to integrate algebra and geometry in topics that include the basic coordinate plane, slope, the linear function, systems of linear equations, quadratic functions, distance, and the Pythagorean Theorem. No prior experience with this software is necessary.

Course #5 - Using a Hands-On Activities-Based Approach in Geometry

Hands-on activities will be used to motivate students and to enhance their understanding of geometric concepts. Using congruence to understand and learn basic compass and straight edge constructions will be one aspect of the course. These constructions will lead to explorations involving the centroid, circumcenter, the angle bisector theorem, and the golden rectangle. In addition, there will be many other hands-on activities that will be exploratory in nature, will involve data collection, and will use the TI-83 graphing calculator to analyze the data. Integrating algebra and geometry in many of the activities will also be an important part of this course.

Course #6 – Teaching Geometry While Effectively Integrating Algebra

One way to solve the age-old problem of students losing their facility and knowledge of algebra during their year studying geometry is to effectively integrate the two disciplines. This course will concentrate on the many problems and topics in geometry that present teachers wonderful opportunities to maintain their student's algebra skills while learning or discovering important geometric ideas. Learn to bring new energy and enjoyment to topics that are all too often dull and boring to teachers and students alike. This course is appropriate for both algebra and geometry teachers.

Course #7 - Problems that Bridge Algebra and Geometry to Higher Level Mathematics

There are many wonderful problems that are accessible to Algebra and Geometry students that effectively help develop the analytical skills necessary for success in mathematics at the higher levels. This course will examine sequences of problems that start early in the mathematics curriculum and can be used to gradually develop concepts like optimization, instantaneous rates of change, limits, and other advanced topics without the formality introduced in a Calculus class. The TI-83 calculator will be used extensively.

Course #8 - A Fresh Look at Trigonometric Functions and their Applications:

This course will examine some alternative approaches to introducing the trigonometric functions. There will be some hands-on activities as well as calculator activities involved in exploring important trigonometric relationships. Much of the course will focus on applications that use trigonometric functions to model real world problems. The TI-83 calculator will be used extensively.

Course #9 – An Extensive Exploration of the Conic Sections

This course will thoroughly examine circles, parabolas, ellipses, and hyperbolas. Many new and alternative applications using these important curves as models will be explored. The introduction of both the parametric and polar form of these conic sections will allow an entire new class of interesting problems to become available. The important role that trigonometric functions play makes this course and Course #6 fit very nicely together. The TI-83 calculator will be used extensively.

Course #10 - A Fresh Look at Introductory Calculus

The principal goal of this workshop is to show how Calculus can be taught using examples to introduce and refine core concepts. Exeter's Math 4 materials will be used to:

- (a) deduce the slopes of elementary curves in memorable, conceptually significant ways;
- (b) use tables and thought-experiments to develop facility with a variety of rate problems;
- (c) tackle the problem of instantaneous versus average velocity;
- (d) apply derivatives to interesting situations;
- (e) look at the number e from a number of different vantage points;
- (f) introduce integration in natural settings, where it can be understood;
- (g) introduce integration in a way that makes the Fundamental Theorem apparent, without the need for special notation;
- (h) develop traditional notation as the course proceeds, always to describe situations that are already understood.

Course #11 Using a Hands-On Activities-Based Approach in Algebra II and Above

This course is most appropriate for teachers who teach at the Algebra II level and higher. Hands-on activities will be used to motivate students and to enhance their understanding of mathematical concepts. Many of these hands-on activities will be exploratory in nature, will involve data collection, and will use the TI-83/84 graphing calculators to analyze the data. Topics explored will include exponential functions, conic sections, polynomial functions, probability, optimization problems, and an overall emphasis on pattern recognition and problem solving.

Course #12a - Vectors and Parametric Equations 1: A refreshing new look at lines and linear motion in two and three dimensions. When created using vectors or parameters, equations of lines can tell far richer stories than their standard counterparts. They also enable explorations in three dimensions, often avoided at an elementary level. Finally, they can be used to generate simply-stated geometric proofs, often more elegant than the comparable synthetic derivations. Usually delayed until precalculus classes, the vector and parametric ideas in our Math 2 materials are readily accessible to any post-Algebra 1 student.

Course #12b - Vectors and Parametric Equations 2 (with matrices): The ideas begun in Math 2 are expanded in our Math 3 materials. Parametric equations are applied to circular motion, as well as to objects traveling in elliptical or hyperbolic paths. The algebra of vectors is formalized, leading to the development of the Vector Law of Cosines, among other results. The dot product leads naturally to the development of matrices as an algebraic tool (with interesting geometric applications). In addition, planes, and their linear equations, are studied as the natural three-dimensional analog to lines in two dimensions.

Course #13 – Topics in Advanced High School Mathematics

This course will examine some alternative approaches to various high school advanced topics, and some very interesting application problems. Topics may include: trigonometry, vectors, conic sections, optimization, limits, parametrics, probability and statistics as well as other topics that participants would like to study. Participants are invited to suggest topics on the registration form that they would like included in this course.

1. _____
2. _____
3. _____